BIO-DYNAMICS

A periodical furthering soil conservation and increased fertility in order to improve nutrition and health.

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BIOLOGICAL AND NATURAL CONTROL OF INSECT PESTS

EHRENFRIED E. PFEIFFER

The biological control of insect pests is at present the Cinderella among the measures being taken against their overwhelming increase. This need not be, but the modern trend of technology over-emphasizes the importance of chemical means of combating insects and overlooks the fact that these pests may have developed just because of this one-sided trend. The aim towards quantity production, by neglecting the quality production factor (a result of modern economy as applied to agriculture), is the factor that has created these one-sided conditions.

In the last 40 to 50 years, one could hear only the cry for increased production. Seed breeding, monoculture, fertilizers, cultivation methods — all were geared to increase the per acre yield. The increase of insect pests is the unavoidable answer by nature to the violation of one of the most important principles of growth — that of balance — biological balance. Quantity production neglects the problem of quality, of health, of environment, of symbiosis, etc.

A point of philosophy, of human attitude, is involved. It is the mechanistic concept which celebrates its triumph in our age, versus the biological concept, with which but a few are familiar. The more limited use of the latter concept is due to the more complicated demands on the observer of nature with regard to matters which cannot be expressed in static (= dead) figures but require an ever-changing, that is to say, sliding scale, or dynamic approach.

We hear from every side "Kill" — kill the pest, the bug, the enemy. Hence chemicals, poison sprays, insecticides and weedicides are tried and developed. They kill indeed, for a while; then nature invents resistant and immune bugs and a stronger poison is needed, with the final result that a vicious cycle was begun, the end of which is not yet in sight. It seems, however, that THE BUG is on the winning team. After all, Nature has had millions of years of experience in the struggle for survival, man only a few tens of thousands.

This is the first point we want to make: As long as one thinks that killing solves any problem, we will lose. After all, killing has never solved any problem. There will always be

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something, someone, who survives, and the cycle starts again. Furthermore, if we kill ourselves out of existence, what then?

The biological viewpoint, on the contrary, works with the balance of nature, growth; is concerned with what is healthy and diseased. An agricultural environment in which bugs get the upper hand is seriously diseased and is doomed to collapse some day. The fact that there is increased production should not deceive us. We must ask: What is wrong? In what way have we sinned against nature? Above all: What is the price we are paying? True, we may be harvesting 50% more than 50 years ago. But then nobody sprayed. Does not the cost of fighting pests already outweigh the value of the increased production, plus the loss by insect pests thrown into the bargain?

This is our second point: Insect pests are Nature's answer. While we have raised our production by so-called modern methods of agriculture, we have at the same time raised the amount of pests. The five billion dollars per year damage by insect pests in the U. S., plus some 750 million dollars for pesticide application, is also a crop — in fact, the most successful one the U. S. farmer raises. As soon as we acknowledge this fact, without false shame or disguise, we will begin to appreciate the fact that there might be another approach to the problem.

It is obvious that, given a favorable environment, pests will spread. Monoculture in orchards, in vegetable-truck farms, in forestry, provides a field day, a free-for-all condition. To force a plant to grow more bulk — by fertilizers, for instance — will cause the plant to change its inner biochemistry. As Prof. Albrecht of the Missouri Experimental Station has shown, more carbohydrates and less proteins will develop in such plants. Insects are out for carbohydrates and so find not only a well prepared table but also a very suitable diet.

In nature, untouched, there is a balance: Not only are there bad bugs, but there are also predatory enemies. In nature, untouched, there is a variety of crops, not monoculture. There is symbiosis, so that one helps another. For thousands of years the bad bug was held in check.

We therefore have to study, first of all, the conditions under which natural balances, resistances and defenses function, and we have to admit the extent to which we have violated the inflexible laws of nature. This admission of guilt is the first step toward improvement, toward reversing the torrent. This is the basic concept of the biological approach.

This concept, we admit, is difficult, demanding, is not everybody's meat, and it is here where most fail, because this concept is not mechanistic but requires living with nature, requires imagination. It is so much easier to buy a poison and spread it with a machine. People who have nothing to do with agriculture proper develop the poison in laboratories or design suitable machines. The farmer and grower do not need to think. To establish biological control and balance requires thinking and understanding by the actual operator of the farm. Also, it means that he may have to adjust his production methods, his crop rotation, his juxtaposition of plants — and here lies the real crux of the matter.

We should not blame the experts — the entomologists, for instance. They really worry and consider both sides — how to kill and how to introduce biological control. But this group is still too small, too limited in means. If all the money spent in the development of insecticides were applied, say for 5 years, towards the study of biological control, the picture would be entirely different. It costs a manufacturer $1,500,000 to develop an insecticide and another $100,000 to prove its worth, harmlessness, etc. The only ones who would profit from biological control are the farmer and the grower; there is no profit otherwise.

Just one year ago, September 1957, there was an International Congress of Plant Protection in Hamburg. Papers were read on poison control, but almost as many dealt with problems of biological control.

What does biological control consist of? First of all, restoration of Nature's balance. Least is done in this direction. Second, sponsoring predatory enemies of pests. Much is already known on this subject. We will give a summary of it later on. Third, the introduction of diseases specific to one insect pest and not to the predatory enemy of the pest.

Now let us survey what is known. There is, for instance, the use of the small red forest ant against the small fir needle wasp. Also, the ladybird is one of the most beneficial beetles in an orchard against aphis, mites and scale. The efficiency of ladybirds is astounding if one considers that one larva devours from 15-25 aphids per day, and this over a period of three weeks. Ladybirds hibernate in holes in trees and underneath loose bark. One can build small hibernating "houses" for them out of bark. To attract the beetles, it is only necessary to put a few dead beetles into the boarding house, the smell of which seems to in-

vite them to move in. (C. G. Gameron, "Balance in the Insect World," Newsletter of the Bio-Dynamic Farming and Gardening Assn., New Zealand, Vol. 9, No. 4 and Vol. 10, No. 1, 1957.) Unfortunately, when we spray poison, we kill these friendly insects. Again, the grasshopper mite is an important enemy of grasshoppers. (1)

Dr. Stanley Flanders of the Riverside (Calif.) Experimental Station suggests the use of specifically bred ants to fight scale and aphids. The Chinese already used such ants two or three thousand years ago for the control of citrus bugs and caterpillars. Tree nesting ants are hung by farmers in their citrus groves. In Germany, forest ants are protected by law as being the real wood sanitation police. In India, ants were used to destroy termites. Instead of looking upon ants as a nuisance, which many do, why not breed and train useful strains?

The screw worm, a pest in Curacao and Florida, has been successfully reduced by sterilizing the male fly. Since the female mates only once in a lifetime, this measure can be very successful. The use of the "milky" disease, a bacterial disease of Japanese beetle grubs, has been successfully developed by the Moorestown, N. J. Japanese Beetle Research Laboratory. An issue of the Rotarian last year contained a noteworthy article by Peter Farb, "Biological Control vs. Insect Pests." (2) It is reported that controlling measures against 75 of the most obnoxious pests have already been developed. In Southern Rhodesia, the male sterilizing technique is used against the tsetse fly. Even the harmless and peace-minded goldfish in a garden pond fulfills an important task by eating mosquito larvae (provided it has not already been killed by DDT). Insecticides, unfortunately, have all too frequently killed natural predatory enemies of mites, scale and red spider, and the latter have become abundant — in greenhouses, for instance.

A certain nematode, because it carries a bacterial disease, destroying some 30 insect pests, is promising against the codling moth, corn earworm, possibly also against bollworm on cotton. Bacterial diseases have been successful against the alfalfa caterpillar.

The U. S. Dept. of Agriculture issued a technical bulletin in June 1956 on the "Biological Control of Insect Pests in the Continental U. S." (3) This excellent report should be read, studied and taken to heart by every farmer — organic, natural or other-

wise. 91 insect pests are dealt with in this paper. The natural enemies of 77 were imported from abroad; for the balance, locally existent enemies were fostered. This program of the U. S. Dept. of Agriculture has been under way for more than 60 years and is far too little known. The paper states modestly that no complete control could be found but at least a partial control. That complete control could not be established, according to our opinion, is due to the fact that monocultures, environmental conditions, the disturbances of Nature's balances, counteracted any sensible biological approach. Here the farmer must first learn to put on the brakes.

In the fight against insect pests, trapping plays an important role. Electrocuting fly-traps, as produced by the Detjen Corporation, Pleasant Valley, N. Y., have proven to be very successful. They contain an electric light bulb, surrounded by a screen with high voltage but harmless to humans. All night flying insects which approach the light are electrocuted. The amount of insects collected per night can go into the hundreds; one observer counted several thousand over one weekend. One orchard pest — curculio — cannot be controlled by this fly-trap, but all moths are caught.

The same principle can be modified by putting an electrocuting screen over a box, spiced with a bait. One could mix the bait with some poison held in the box which, in this case, would not spread or contaminate anything else. This would also serve as a trap in the daytime. Our observation was that one or two such light bulb traps would be sufficient per one or even several acres of orchard.

Other traps consist of a sugar or molasses solution with some poison placed in jars among the branches of trees. At least one jar should be hung to each large tree. The opening of the jar is covered with a small screen — for instance, 1/8 or 1/4 inch holes, so as not to admit bees. The trap can be spiced with insect attractants. Which to use in each case (since these are specific), is still a matter of observation and research. Oil of sassafras has been recommended against codling moth. Oil of anise seed has shown promise. Flies and fruit flies, are attracted by it, as well as by apple ester. Synthetic products may be used here and are admissible in a trap because they do not contaminate anything else. Anisylacetone (2) was found to attract the male melon fly; angelica seed oil attracts the male oriental fruit fly. Methyl-eugenol attracts the male oriental

fruit fly; 2-allyloxy-3-ethoxybenzaldehyde attracts both sexes of this species.

As S. A. Hall of the Entomology Research Branch of the U.S.D.A. reports, "we have just scratched the surface." (4) The sums spent for developing just one insecticide might be sufficient to give the answer to many of the problems of biological control.

This writer would be very happy to collect and later publish data on attractants and repellents to insects.

At the moment that spraying of poisonous materials can be abolished, bird control becomes one of the most important means of biological control. One pair of titmice, feeding a brood of 3-4 young, will consume some 800 caterpillars and insects per day. With 10-16 pairs of titmice, one can completely control one acre of orchard. One only needs to hang a nesting house in the trees and there will be many other birds which will move in and take over. Hedges, especially those which have thorns and which form a thicket, provide other nesting facilities, in addition to the fact that they improve the biological environment — for instance, prunus spinosa, hazel, filbert.

The symbiotic, protective effect of juxtaposition of plant species has been all too little investigated. Nasturtium, planted in between fruit trees, is said to spoil the taste of the fruit tree sap for aphis, apparently because its aromatic principle is absorbed by the tree roots. The sandfly dislikes tomatoes and vermouth (wormwood). The white cabbage butterfly dislikes the smell of hemp, tomatoes, rosemary, sage, peppermint. Rows or even only "nests" of these herbs between the cabbage rows act as natural repellents and interrupt the monotony which stimulates specific pests to spread. Bait plants, such as lettuce, spinach and slices of potatoes, can be strewn against grubs and larvae in the ground. Empty used grapefruit and orange halves, upside down, collect snails, grubs and slugs underneath. These can be collected every morning, for instance, in a small garden.

The subject of non-poisonous, non-lasting residue sprays cannot be discussed here. However, the application of the B.D. Tree Paste (5) must be mentioned. This consists of a mixture of special clays with organic non-toxic ingredients and has proven its worth when properly applied. It has been most effective when used several times a year, spraying it on the trunks, branches, buds and foliage. Wormy apples in several test orchards have, by this measure, been reduced from 100% infesta-

tion to 80-60% in the first and to 40% in the second year of application; in the third year to a minimum. This very same clay-paste-spray was this year tried against soil pests as a mulch, to be sprayed around the plants right after they come up, or in between rows. It does not contain any poison but, not only did it make the plants stronger, it also reduced the need for weeding from three times to just once. Sprayed on the foliage of green vegetables, carrots, beets and beans, it protected them quite well against beetles of all kinds. This spray mulch was tried out under our supervision and will become a very important means of control.

We do not doubt that a concentrated all-out effort with regard to biological control could solve the problem of pests within a few years. But biological balances, crop rotation, mixed cultures, must be established at the same time in order to obtain 100% results. It is here that our methods of production require the first correction.

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SUMMER CONFERENCE — 1958

A REPORT

FRED HECKEL

A practical work program of far-reaching implications for agriculture and human nutrition, being undertaken by the Bio-Chemical Research Laboratory, was outlined by Dr. E. E. Pfeiffer before a large and interested audience at the Annual Bio-Dynamic Association Conference. Speaking on Sunday, August 3rd, the final morning of the three-day session at Threefold Farm, Spring Valley, N. Y., the Laboratory's director presented, in terms clear to any food grower and consumer, the outlines

of an important project — it will take at least a decade to carry it through — on which he and his co-workers are already embarked. It will be reported on scientifically as the work progresses. What follows is merely a layman's story of what he heard at the session.

First the speaker referred to the still current strivings of our agriculture for *high yield,* the great aim of seed breeders in general. This goal, he pointed out, is most understandable since, up to now, the farmer and gardener are paid in terms of how much *bulk* they produce.

The factors which support life have to be balanced against each other, as in a mathematical equation. The elements of this problem of balance include: in the soil — its chemical and physical structure and the soil microlife; in the seed — such factors as volume of yield, viability, and resistance to damaging effects of drought and of excessive rain. Of high-ranking importance in this "equation of balance" are, of course, the nutrients, water, warmth, light, and a number of X factors.

Life and growth, Dr. Pfeiffer emphasized, are and must be recognized as a product of all of these. If you change any one factor the entire system will be changed. Hence, if I alter one I must change another, so as to maintain the balance. Health, the health first of the plant and then of the animal or human consumer, can, therefore, be reasoned out, can almost be calculated in mathematical terms.

Because the laws of life and growth are laws of an eternal harmony, they are unshakable, the speaker continued, if we are religious-minded we call them the Laws of the Creator. So, if we change something in one of these factors, disregarding the necessary compensating changes, nature herself will move to restore a balance. While we are literally in no danger of making an error as long as we *respect the balance,* we are in fact constantly violating the laws of nature in our one-sided striving for more bulk, more yield. For instance, we can apply large quantities of chemical fertilizers and get a temporary increase of crop production; but this will, among other things, affect the structure of the soil. Even the use of well-rotted organic manure, at the wrong time, will simply introduce something that remains as a foreign body, unchanged, in the soil.

On the other hand virgin prairie soil remains unchanged year after year. We have a bottle of such soil in our laboratory. We have had it here for 25 years. We analyse it year

after year and it remains the same. Nature, untouched, is indestructible. Of course, in agriculture, we cannot leave the original pattern unchanged. Yet if, as we make changes in the pattern, we *compensate,* we can get maximum yields without harming our soil.

Citing practical examples of consistent high yields attained in this way, Dr. Pfeiffer remarked that with regard to *yield* the limiting factor is *water.* Thus to produce a pound of wheat we need 500 pounds of water, for a pound of corn 650 pounds of water, and 800 to grow a pound of alfalfa. But a mineralized soil will not hold water, and thus our yields are limited by this. Humus, on the other hand, holds its own weight in water.

He referred briefly to the fact that forcing plants to produce more starch and sugar, as has been done by our seed breeders, has had a great effect in aiding the increase and spread of insect pests since the higher sugar content makes those crops more attractive to insects.

He went on to tell of recent work by the Laboratory in connection with the protein content of seeds, published in part in a recent issue of BIO-DYNAMICS. Tests have shown that with consistent use of the B.D. Starter the pattern of the soil microlife has been changed. Plants grown in these soils yielded about the same as before, but the structure of the plant is different. One of the tests, analysing seeds for their amino acid content, showed that "we have gotten a more efficient protein, with less of it needed to support life and health, and have done this just by changing the soil structure, soil organic matter and soil microlife."

Telling of the germination tests made after exposing the seeds to heat, Dr. Pfeiffer added:

"In terms of bio-chemistry, we have to say that these seeds do not behave according to what is known. We have discovered that certain seed proteins and seed enzymes that had not been thought to be heat resistant are heat resistant. We found that if proper balance is maintained in the factors on which plant growth is dependent, there is resistance against damaging factors. This is to say, we are on the threshold of a new biology, a new knowledge of nature.

"We have also discovered that we can change the protein pattern in a seed, increasing, in the same seed, certain essential amino acids, lysine, for instance, and arginine, depending on the solution it has been germinated in. This means that we can in-

crease the quality of the protein so that we can feed less and yet give the same nutrition.

"We are starting now to begin a seed selection, not for quantity but quality production, to enhance the properties of protein quality. We can do it in five to ten years. I did something like this in 1928 to 1938, developing a high quality, high yielding wheat, so I am sure this task can be accomplished. Only from such a foundation can we really start to build up health, until then we are only dabbling in the problem.

"Yet if all this is done, there are still the unknown factors in the equation, in connection with the problems of warmth and light. The Russians, being both ruthless and unprejudiced, have made discoveries in this field, which we in this country by-passed because we have been so fascinated by the problems of genetics. Now one knows that genes can be changed by harmful radiations. I say, if they can be changed in this way, why cannot they also be changed for the good.

"The Russians now are working to learn to control the factors of light and warmth, factors of cosmic origin without which there would be no plant growth.

"It is known that with the light process in the plant there are combined also the enzymes which bring about metabolism, and these are connected with phosphorus. Phosphorus carries light. Sulphur carries the warmth energies in the plant. This is modern biochemistry.

"As a chemical substance releases warmth when it breaks down and we live from this energy, so we must assume that a similar process exists in relation to light. The production of carbohydrates (sugar) is, on the contrary, a darkness process. This is the one we have favored in agriculture and our harvest is insect pests. We have to favor protein production, i.e. the light process. Then we can solve the problems of agriculture and nutrition. This is our program, now and on into the future."

As Dr. Pfeiffer discussed related problems of agriculture and nutrition in this and other talks at the conference, so Walter Stuber of Golden Acres Farm, along with Russ Keep, Jr., spoke on "The Distribution of Bio-Dynamic Products." Heinz Grotzke of Golden Acres gave a paper on the subject of "Successful Bio-Dynamic Gardening."

Catharyn Elwood, the well-known nutritionist, and Dr. E. F. Winter were among the other speakers. These also included

a number of B.D. and Organic gardeners who presented reports on their year's activities. Peter Escher conducted daily field classes on the practical aspects of B.D. composting and Hans von Wurmb demonstrated the latest developments in the use of the Tree Paste Spray.

Dr. Winter's talk had been preceded by a visit to his successful, family homestead project, via a caravan of automobiles. At the lecture session he spoke in particular of his greenhouse experiences.

One of the most interesting meetings of the Conference gave a graphic picture of the problems involved in trying to help India's millions to help themselves to raise their standards of agriculture and nutrition. This was a panel discussion presented by Mr. and Mrs. Richard B. Gregg, well-known to readers of BIO-DYNAMICS, and Dr. and Mrs. Elton Kessel. Both couples had recently returned from India, the Kessels from several years of public health work there. It is hoped to have a paper by Dr. Kessel in a later number of this quarterly.

The closing evening was devoted to an artistic program. It consisted of a presentation of Eurythmy by Sabina Nordoff and her Group, and a performance of Christopher Fry's "A Phoenix Too Frequent." The actors in this production, directed by Ruth Pusch, were Bettina Kroth, Danilla Rettig and Hans Pusch.

AT THE SUMMER CONFERENCE

Seventeen of the Forty-nine States, and the District of Columbia, besides Canada and Australia, were represented at the 1958 B.D. Conference at Spring Valley, N. Y., according to registration figures from our B.D. Association secretary-treasurer, Mrs. Harris Porter. The total registration was 166, and there were a number of others who dropped in for one or more lectures but did not register.

As would be expected, New York, Pennsylvania, New Jersey and Connecticut accounted for the largest part of the total of participants, 61, 24, 19 and 18 respectively, but 44 people made the effort to come from greater distances. There were two who came from Florida, in the South-east, and four from the State of Washington. The registration included 101 B.D. Association members and 65 others. It was a particular pleasure to have a good number of N. F. A. members at the sessions.

THE GREENHOUSE ON THE B.D. HOMESTEAD

ERNST FLORIAN WINTER

Introduction

Let it snow, rain or storm outside, in our little "paradise" under glass plants grow and bloom; the solarium warmth makes for fun for young and old. During courtship we dreamed of our future greenhouse and today there are already eight of us who would not live without it.

In preparation we visited other domestic greenhouses and were especially inspired by Mrs. Ballou's and Mrs. Gregg's (formerly Miss Speiden). We read about greenhouse gardening. Excellent were three articles by Rev. and Mrs. Philbrick in BIODYNAMICS (Winter-Spring, Summer, Fall 1955, 36, 37, and 38). They gave us the final push. On January 1st, 1956 our 30′x8′x9′ "paradise" was a going concern. Among the books, Ernest Chabot's, dean of American greenhouse fans, is most useful. Finally, Dr. Pfeiffer inspired us to live with and learn from Nature. And indeed, for any greenhouse beginner, learning by doing is half the joy, as well as a most rewarding way of helping to expand the frontiers of our knowledge of "organics."

Technical Data

Slanted, straight-sided, curved eaves or lean-to type greenhouses can be quite harmonious with many styles of architecture. For economy in growing area, sunlight, and ventilation, a connected greenhouse with an even span of glass on both sides appears best. Easiest to connect to our home was an angle-eave, lean-to type, accessible both from the outside and from the inside through the children's room, with big glass panes peering into the greenhouse lusciousness from three different rooms in the house. The children play in this solarium; the baby takes its sun-bath: everybody loves to soak up health-giving sun and relax in the "winter-garden." Sometimes we catch a bird who flew in. Frogs and snakes have come to hibernate. All sorts of insects hum and buzz in it even during the wintry days. It has been an excellent place to dry herbs, teas and seeds. The earliest broods of spring chicks and ducklings have gained their strength there without electric lamps.

When considering the size and material one should not build too small nor too cheaply. The larger the volume of air, the nearer we are to real-life approximations. An 8′ by 8′ house with 2 benches actually costs more per square foot to build than

a 14′ by 18′, three-bench greenhouse. Aluminum, California redwood or cypress are used as construction materials. No satisfactory glass substitute exists as yet. Plastic can be five times as expensive. Moreover, most polyethylene, vinyl (cast or calendered) or cellulose acetate butyrate plastics suitable for greenhouse use deteriorate rapidly during the summer impact of ultraviolet rays. One season's use is the average. Most plastics transmit up to 80% of the visible light energy (good glass 90%), and 70%-80% of ultraviolet (which is much better than usual glass). Two layers of plastic with airspace between help solve the moisture condensation and some insulation problems. Fibre-glass polyesters allow 82% of available light penetration when new. The condensation drip off its corrugated sheets constitutes a problem. The bright surfaced acrylic plastics need polishing every 3-5 years. Thus until further research turns out a more satisfactory product, glass permitting ultraviolet rays (no thermopane!) still appears the best.

Sunlight is, of course, the best heat source. Morning light is the most important for plant development. Depending on what one wants to grow (orchids and African violets being tropical want diffused light, for example), the greenhouse will face squarely or obliquely the course of the sun. Afternoon shading is welcomed by most plants. But one soon discovers within an operating greenhouse at various times of the year different "local" conditions. Corners and sides can be utilized by those plants happiest with these variations. Like your garden, so the greenhouse soon reveals its versatile temperament. Electric, oil, natural gas space heaters with built-in fans or a separate heater room (because fumes can mean death to plant life), or a thermostatic connection to the house-heating system, provide the extra needed warmth. Electric space heaters (2 or 4 kw heating units) are gaining in popularity. They can keep a 13′ by 18′ greenhouse at 50° F in our latitude for $150 a season. The hook-up to the house-heating system is of course cheaper. The tendency of beginners is to keep the temperature too high. Depending on what one grows, temperatures should not be higher than 30°-50° F at night and 55°-75° during the day. We discovered that we had best success in growing vegetables during the winter, by keeping the temperature low and even allowing light frosts during some nights.

A greenhouse should be equipped with running water, electricity, a work bench, tools, shades and a record book (for plant-

ing dates; compost mixture, spraying and feeding information; sunshine hours and moonlit night observations, etc.). Depending on what you plant, it pays to keep the greenhouse going all summer. This summer we are running an experiment with growing melons, while other potted plants are taking their vacation in real rain outdoors. And we are observing compost development on the benches, having brought in very raw compost in early summer, watering and aerating it continuously.

Life in the Greenhouse

The soil is the key to success. The desired loose fibrous mixture in which roots can easily stretch out for nutriments, water, and air, is best provided by a compost mixed with a little clay in our region, where the soil has a tendency towards sand. More than 3/4 of the volume, though, is raw compost. Roots will hug and cling to decomposing materials. As the organic content of the soil drops, the bacterial population goes down. One must constantly recall that greenhouse conditions are concentrated, artificial tropical conditions. Here man can most easily preserve, as well as most quickly destroy the balance of Nature. Nature the Scientist can teach us much, if man learns the symptoms of disorder in Nature. The greenhouse is the winter-schooling for the gardener. In one greenhouse season you can learn more than in ten years of gardening, if you are observant enough. You can also remedy your mistakes astoundingly quickly. Here just a few hints can be given on how to approach this School of Nature.

We know that the upper part of the soil is 1/3-1/2 air, 1/10 to 1/4 water. Heat, rain, and wind work upon this crust forever. In the greenhouse the biological forms, that is the life forms of the soil, will alter in accordance with the air, water and sun (heat) that man makes available. Man will do consciously everything possible to sponsor the biological processes. These in turn he learns from Nature. Humus is both the food and the habitat of soil life. As it becomes depleted, the soil life begins to die. With this in mind we carefully prepare a compost with special ingredients (various types of manure, disease- and insect-free organic matter, and soils). This once turned and only half-ripe compost-soil we have carted into the greenhouse benches and the ground-level beds by September. We mix this with the soil left after the spring transplanting (when a very liberal scoop accompanies each plant out into the garden). Thus the greenhouse benches are never completely cleared. We

do not sterilize the soil. Why sterilize? "To destroy harmful fungi, bacteria, insects and other organisms such as root-rot, symphilids, grubs, nematodes" (Cornell Bulletin No. 635, 1944). Or as Chabot states, "for larger quantities of soil, I like to use one of the gas-forming preparations such as Dow-Fume MC-2, or Larvacide, which do a real job of sterilizing. Both are dangerous poisons, but don't let that scare you." It seems too bad to take recourse to such old-fashioned extremes. Modern agricultural science is telling us so many new things about Nature. The greenhouse tender too can take advantage of these most modern insights. A properly prepared compost once possessed a decomposing temperature of 150° F, acting as a selective sterilizer. Not all soil life, insects and earthworms are to be destroyed. We want a living soil on the benches which helps provide the balanced soil and insect life also *within* the greenhouse. As Goethe expressed it, "in living Nature there is nothing that is not connected with the whole."

This is also kept in mind when feeding the plants. When soil is brought in, one can spray with B.D. 500. Spray with 501 during the darkest wintry days. Valerian and equisetum, stinging nettle and vermouth sprays are also valuable. Nature invites you to try more and others. Basic, however, remains the presence of organic matter which allows for the perpetual cycle of life, death and re-creation. This cycle is more rapid under greenhouse conditions! Usually there will be no signs of a lack of nitrogen (growth stunted and yellowing of leaves). In fact, care should be taken to limit nitrogen in composting, because too much induces plant sickness (mildew, wilt and virus disease). Phosphorus stimulates root growth and hastens maturity. Potash gives strength to plants, improves quality of foliage, flowers and fruits; makes for resistance to disease. We supply a greenhouse compost pile which builds up under one of the benches and is used for raising earthworms and as supplementary plant nutriment, for example, with dried blood from butchering (nitrogen), horn and hair clippings (phosphorus), ashes from oak fires in the fire-place (potash) and lime. Earthworms work on this pile all year round. Actually, homeopathic doses, so to speak, of this compost do improve the soil quality on the benches. Lime can be used rather liberally in the greenhouse, because the otherwise often wet greenhouse conditions create a tendency towards acidity. But avoid hydrated lime. Ground limestone $CaCO_3$ or unslaked lime (hydroxide) act as soil correctives and conditioners. Peat moss and leaf-mold can

be added to improve soil structure. Definitely, a constant cultivation around plants shows very beneficial results, especially after each watering.

Watering and ventilation go hand in hand and conclude the four necessities of soil, heat, air and water for healthy growth. Excessive watering is almost certain to cause troubles. A thorough watering is to be preferred over frequent shallow ones. Subirrigation or letting the water soak in without touching the plants is preferable to spraying. Not too frequent mist spraying either late at night or very early in the morning simulates dew and is beneficial. One should not spray in strong sun (and the glass panes ought to be painted against too strong summer sun) and never water under overcast skies. Like so many gardening operations, these seem formidable at first, but become easier with repetition *and* the acquired "feeling." The continuous "discovery" of Nature is most exhilarating! The greenhouse is most conducive for that! You'll surely observe very quickly whether the plants enjoy your solicitousness or not! Finally, ventilation is not just for admitting fresh air, but mainly for temperature control and thus the most ticklish greenhouse operation. If one does not have the feel or time, an automatic ventilator is better than the wrong ventilation.

What to plant and when? Just about everything will grow in the greenhouse more lusciously and to greater perfection than outside: flowers, orchids, bulbs, flowery shrubs and climbers, foliage plants, cacti, succulents, vegetables and many fruits. We enjoy dwarf lemons and oranges. But one has to act the bee for the pollination of these (and others, like melons). Companion planting ought to be followed. Very helpful is planting with the moon, especially when the bright "harvest moon" nights give the winter-garden under glass its new birth. Moonplanting experiments can be carried out most successfully under the quite controlled greenhouse conditions.

Our flowers utilize the shelf space. The benches are for the vegetables. Compact vegetables give the most economic yield. Deeprooters (like parsley) should sit on the ground, i.e. a bench connected directly with the earth on the floor. The following will do well on the benches: scallions, radishes (early October onwards), lettuce (end of August onwards), celery, kale (also outdoors under snow or with the British Clochegardening system, as sold by Mease's, Schoeneck, Penna.), New Zealand spinach (hanging down from the bench), herbs (mint,

chives, stinging nettle, sweet basil, borage, dill, sweet marjoram, thyme, camomile, vermouth), beets for greens and roots, Swiss chard, etc. In the small greenhouse it does not pay to grow rhubarb, asparagus, peppers, tomatoes and eggplant, because of their need for high night temperatures. The transplanting, thinning out, weeding and cultivating are absolutely ideal: there is *no* back-aching stooping down. The upright operation with snow outside and a "Florida-sun" warming your back inside, is absolutely a luxury!

A final consideration is your pest and disease control. It is easy to keep most pests outside. You have a good soil, good light conditions, warmth, water, air. Everything appears ideal. But after a few weeks the first troubles usually appear. These may be midge, mealy bugs, red spider mites, scale, thrips, white flies, nematodes, snails, slugs, aphids, ants, wasps, hornets, mice. Actually all we have ever had have been mice and aphids. Careful B.D. management will prevent pests and diseases. The many aphid varieties, (small, sucking insects) take about 12 days for maturing, and if conditions become too crowded some grow wings, take off and are sure to infest the cleanest corner of your greenhouse. This growing of wings our children consider a fairy tale thrill. Grown-ups too do well not to be upset. We have found the introduction of ladybugs a sure control measure, with the added satisfaction that all winter long these lovely harbingers of spring and sunshine multiply, instead of hide. One's supply of ladybugs can be purchased, or, as in our case, found hibernating under old boards in the attic. We have found no need to purchase any of the commercial warriors such as "End-O-Pest Dust," "Protexall Garden Spray," "Plantfume 103-A" and their streamlined serial-number colleagues. One should always bear in mind that poisons like DDT used in the confined greenhouse space will be much more lethal to life. The breathing and smelling of rose-geraniums or other highly aromatic plants is both more pleasant and beneficial. Fungi and bacteria are the cause of most diseases. Leaf spot, mildew, rust, virus disease, stem and root rot, wilt, damping-off are just some of the criminals. Again, in our B.D. managed greenhouse we have been bothered only with damping-off, and that was brought under control after H. Grotzke recommended that we spray with camomile tea.

The B.D. method has proven the best preventive for disease, the best method to insure vigor in the plants and healthful

quality in the food. Besides the many other plantings, our winter-garden gave us over 100 crisp heads of lettuce during last season. These are only some of the experiences and observations which have made our greenhouse, like our garden, an indispensable part of our self-contained B.D. homestead and "organic way of life."

BOOK REVIEW

AMERICAN AGRICULTURE: Geography, Resources, Conservation. Edward Higbee. John Wiley & Sons, Inc., New York 1958. $7.95.

The nearly four hundred pages of this book comprise a veritable encyclopedia of information about the agriculture of our country. The author, Edward Higbee, Professor of Geography and Agricultural Economics at the University of Delaware, is indeed well qualified by background of study and experience for such a work. Besides his studies and teaching experience, Dr. Higbee was a conservationist and senior agronomist with the U. S. Department of Agriculture from 1938 to 1947. During this same period he served as consulting agronomist to the Ministries of Agriculture of several South and Central American countries.

The first part of the book presents an over-all picture of land resources, climate and agriculture, soils and land capability. On this firm foundation of geographic, meteorologic, economic and soil data, the author builds up detailed presentations of the present state of American agriculture in all the varied areas of our country. It is a masterly work, profusely illustrated with diagrams and tables. Each chapter ends with a list of references, enabling the student to pursue further whatever angle he desires.

Descriptions are given of chosen farms which are managed in such a way that they make good examples of the wise use and conservation of the resources of specific agricultural areas. Dr. Higbee has visited all of these farms himself and knows every field. This, plus historical data about how various regions developed as they have, adds color and life to the able scientific text.

A. H.

SUCCESSFUL BIODYNAMIC GARDENING

HEINZ GROTZKE

Gardening, as I wish to discuss it, deals with plants and especially with the production of plants for human food. B.D. Gardening employs methods which have been derived from the insight that the plant is but one part of life on earth. It can not be viewed and treated without the consideration of the spheres that surround it, and the connections which plants have with the rest of nature. Since B.D. gardening is based on a science which embraces the whole universe, its practical methods are quite different from those ordinarily taught. To achieve success with these methods the bio-dynamic gardener must gain an understanding of:

1. The plant kingdom in its relationship to the whole of nature.
2. The plant in general, and cultivated plants specifically.
3. The plant in its individuality as related to soil, climate, and origin.
4. The plant and its relationship to the animal kingdom, especially insects.
5. The plant and its relationship to other plants.

The life, which covers our earth, is represented by three stages, not including man: minerals, plants, and animals. The minerals, forming the earth's crust, have been developed over millions of years, never having achieved life in the sense of the plants and the animals. Yet they are extremely essential building materials which nature uses to give substance and form to life, imparting visibility to living things. Minerals make plant growth possible. The entire plant realm can exist only in the presence of minerals. A plant consists of a variety of minerals endowed with life. In nature the first incarnation of life is the plant. Life finds its second incarnation in the world of animals; they have in addition to a mineral basis a life, further developed through feeling and sensation, including the possibility of movement. The plant has no choice about where it grows; it must depend on the wind, animals, or man to move it from place to place, allowing its life to emerge from the seed. The roots are organs which give the plant its anchorage, and take in the minerals, suspended in water. The leaves absorb sunlight and other energies from the outer world which might be associated with it.

On the other hand, animals with their more sensitive life are mobile; they can fly, walk or swim in their search for food. This food is not mineral in nature, as it is in the case of plants, but consists of plants or lower animals, indicating that animals need a material for nourishment that is already alive in order to develop their more sensitive beings.

Of these three natural components — minerals, plants, and animals — plants stand in the center. Towards one side life decreases, towards the other, it increases. The plant requires both sides for its development; minerals to build up the body, animals for their part in reproduction and the role they play in the soil.

The varieties of plants distributed throughout nature are large in number. Yet all plants have several things in common. The green pigment chlorophyl is found in those parts of the plants that are exposed to the sun. Roots can develop in no medium other than one of moist darkness. Light and the absence of light are the two factors therefore which cause the bipolar nature of the plant from the moment it emerges from the seed. And it is this seed which initiates the plant's growth, and through which the plant produces descendants and maintains the species. This, too, applies to all plants.

Although all plants have identical essential needs, one distinction must be made; there are wild or natural and cultivated or domesticated plants. The latter have originated and descended from wild plants but have lost the ability to grow wild and need the cultivation and care of man in order to survive. It was man who directed their growth forces, concentrating them in those parts of the plants which might be used as food. The cabbage, for instance, differs from its ancestor, the hedge-mustard, in so far as all its growing forces are focused in the leaves. While hedge-mustard forms seed in the first year, the cabbage has exhausted its life forces, and the production of its seed must be delayed another year until it is renewed by reentering the cosmic rhythm of the seasons. The cabbage was forced to place all its growing power into the leaves instead of utilizing it in the growth of blossoms. As a result, the leaves were thickened. The carrot is another example. In this case, it is the root, in which most of the growing forces are concentrated. Throughout the centuries, breeding methods have aimed at the sole goal of specializing a plant by enlarging one part of it: seed, fruit, leaf or root, as the case may be. It is through this enlargement,

especially through an increase in the size of the cell, that the original wild fruit, leaf etc. becomes more succulent and tender, ideal for human consumption. To produce this food economically, the plants are grown in monocultures, where cultivation can be kept to a minimum and machinery can be utilized.

In comparison to wild plants, our cultivated plants must be considered as deviations from the normal. In one sense, our crops may be considered sick and deteriorated. They manifest an increased degeneration from year to year, especially those plants which are propagated vegetatively. The most obvious symptom is the increase in virus plant diseases. These diseases evolve from within the plant and represent a decomposition of defective protein. The plant loses its aliveness and tends towards mineralization.

If we realize that our cultivated plants are weak, we can gain an understanding of why they are so easily overcome by disease, insects, and weeds. In nature there is a selective process through which all weak and defective life is eliminated. This is a further reason why a cultivated food plant could scarcely survive without the care of man. Through man's care the plant gains an advantage over its stronger contestants.

Everything healthy in nature exists in a state of balance. Considering the plant as a bipolar organism, a balance must exist between root-system and leaf-growth. By enlarging either side we undoubtedly favour its growth, causing an imbalance of the whole organism. All our efforts, therefore, should be directed towards stimulating the growth of the other pole. In the case of the cabbage, whose leafy side has been enlarged by breeding, help is needed to promote the root growth. At this point, we are led to the soil, the humus, and the organisms which populate and form it, and we think of the bio-dynamic methods which aim at improving the soil.

Today, vegetables in a garden, are members of an artificial community, each neighbour coming from a different part of the world. Most plants in our region are native to southern latitudes and because of their sensitivity to frost they are referred to as tender vegetables. Nowadays, few farmers or gardeners respect the individuality of a plant species, ignoring the plant's origin, history, and the environment in which it used to thrive.

There are two primary factors which affect a plant's individuality and govern its development: climate and soil. The effect of the first, is obvious to everybody. Disregarding its

importance will result in disaster for the plant. A southern plant has no chance against low temperatures. So far, no methods of breeding have found success in making such a plant resistant to the frost. This sensitivity has been inherited for centuries, and points out the necessity of keeping this factor in mind when growing these plants.

The second factor, the soil, is more easily overlooked, because failure to take note of it does not result in immediate death for the plant. Although the cause might not be recognized as such, disregard of the soil certainly does affect the plant to its disadvantage. An example of this, is the appearance of plant diseases brought about by insufficient aeration of the soil. When the relationship of plant and soil remains unclear and disease appears, modern agriculture makes use of fungicides to control the infection.

An understanding of soil and climate and a translation of this into practice, insures, to a great extent, success to the bio-dynamic gardener. It is of great help to know from which country a vegetable derives, and especially what type of soil it prefers. The most ideal way to respect individuality is to create an environment for the plant of climate and soil, most similar to the one in which it thrives naturally. It might be easier now to understand why a bio-dynamic gardener makes different types of compost for different types of plants.

Our next subject certainly concerns everybody, growing plants for any purpose. It deals with the relationship between plants and insects. We need not discuss how all the other animals affect plant growth, because the gardener does not encounter them frequently. Insects, however, inhabit every garden, no matter how small its size. Some scientists estimate the number of insects to be as high as 4 million per acre. This number, of course, includes those insects which live in the soil. Most insects are really very closely connected with the earth, 95% spending at least one stage of their development underground, commonly during winter. In addition to insects, the soil is the home of billions of bacteria, protozoa, mites, nematodes, and earthworms.

Thus the plant, roots as well as leaves, is surrounded by animal life. Which is the way it must be. Without insects for pollination, most plants would be unable to reproduce. Where plant and insect meet, in the blossom, the seed or fruit is formed. There is then a relationship between plants and insects. And

if, in the last decades, so many insects turned destructive, there must be reasons for this to have happened. It is certainly man who has brought about this change. No other being deals so much with plants and animals. By growing plants in monoculture, for example, man has favoured the living conditions of insects by providing an easily found source of their food. The insect has only to eat and reproduce!

Once again, the plant must be viewed as a polar organism if we wish to understand its relationship to insects. Leaves and blossoms grow upwards, into the air, assuming a position in which the sunlight can most fully be utilized. The roots, however, retreat from the sun, directing their growth towards the center of the earth. The plant obeys the two laws of phototropism and geotropism. The surface of the soil, where soil and air meet, is the point of plant neutrality where its two poles separate. Now, both leaves and roots are surrounded by animal life. The plant meets animal life in the air and in the soil. Between these two zones of insect life, there seems to be a natural balance. This means, that insects around the green parts of the plant exist in a certain ratio to the life in the soil. In order for the plant to continue to live it needs both animal spheres, but, in a state of balance.

From observation, it is known that insects are most destructive to plants grown on soil very low in organic matter, and, consequently, low in the number of soil organisms. This means that an imbalance is created between the two poles of animal life associated with the plant, and the lack of life in the soil results in an excess of life on the leafy part of the plant growing above the soil. This excess life, incarnated in insects, since it far exceeds the purposes of pollination, must become destructive. On the whole, therefore, the insect life is rarely found to be related to the blossoms; but lives on the leaves, degraded, one step further removed from the light. The causes of such attacks are obviously not found to lie in the plant, but in the soil, in the life which is or should be part of it.

This, again, explains why the whole of bio-dynamic fertilization practices does not aim simply at replacing plant nutrients, but strives, to foster and increase the life of the soil. This is achieved through the application of compost, a breeding place of soil organisms, and with various sprays which stimulate the soil life.

However, another factor in plant life must be considered which bears on the relationship between plant and insects. Many plants possess odorous substances, the so-called essential oils, which insects find attractive, not only those active in pollination but destructive species as well. The pollinating insects are attracted only as long as the blossoms are in bloom; the blossoms release the fragrance. The degraded insects, inessential and inactive to pollination, respond to the volatile odors generated not by the blossom but by the leaves and fruits. This further connection to the leafy parts of the plants rather than to the blossom indicates a fall from the sun, once more. The opposition of light and darkness or good and evil can easily be recognized if we remember that it is these varieties of insects which pass at least one stage of their development in the soil, revealing their dependence upon darkness. In contrast, bees and butterflies will not complete their metamorphosis away from light.

By careful observation, one will find that insects are more attracted to the plant as its growth declines. This is also the period during which the plant liberates an increased amount of essential oils. This is caused by the decomposition of the lower leaves. In this process the cells break down and expel into the air the odorous oils.

Realizing these facts, two things might be done to counteract the effect of the declining rhythm. The gardener should first try to keep the plants healthy and young, not allowing any part of the plant to die. This becomes a question of preventing plant diseases, a topic previously discussed. The other method is to decrease the attraction of an insect attack for the plant by employing odorous sprays which dominate and thus disguise the plant's own evaporation products. Many biodynamic herbal sprays can be used for this purpose, such as stinging nettle, camomile, vermouth, sage, etc. Fermented cow manure and mustard flour are also effective. There is no doubt that this method of insect repellence works. Most destructive insects are very specialized in their diet and if their favorite food is disguised they are apt to turn to neighbouring weeds or vegetables of the same family.

There are, certainly, many other laws governing the relationship between plant and insect. It takes, however, some time, knowledge and a kind of feeling to be able to understand them.

Next to be dealt with is the science of companion-planting. Much has already been learned about the influence one plant exerts on another plant. Dr. Pfeiffer mentions in his writings several plants which aid each other's growth and therefore should be interplanted. The soil is actually the medium where plants can prove their compatibility. Planting deep- and shallow-rooted plants together is not disturbing, since each derives its nutrients from a different level of the soil. An example is beans and carrots. In this way the soil is used intensively.

In order to avoid going into extensive detail I have to omit bringing into discussion another important factor of plant combinations. This is the factor of the influence that a crop has on the plants that follow it on the same field, the after effects of crop residues and to a lesser extent green manures.

Plants may have an influence on each other through substances excreted by either leaves or roots. Many plants secrete aromatic essential oils, which may have either a stimulating or a retarding effect on the growth of other plants. This phenomenon has been especially investigated in the case of strongly fragrant herbs. It is well-known, for example, that vermouth depresses the growth of practically every plant in its vicinity through the action of a bitter extract, secreted by its leaves and washed into the soil by rain. In most cases, this effect is not as striking, but by close observation one can discover whether a plant is or is not favoured by its companion. This beneficial reaction may even be carried to the point where there is an obvious improvement in the taste and yield of certain vegetables and fruits, which is one reason why herbs are interplanted in our orchard. Some essential oils are more concentrated in the seeds than in the leaves. Mustard oil, the pungent ingredient, present in Cruciferae, (the cabbage family which includes mustard, radishes, and the various cabbage varieties as members) suppresses to the greatest extent the germination of seeds belonging to other families. On the basis of preliminary research, it can be hoped that mustard flour will find use as a practical herbicide.

Since gardening deals also with trees, we should see the tree very clearly in its biodynamic visualization if we wish to care for it correctly. There is a distinction in a tree between the stem, with its branches, and the leaves, with their blossoms. Seen biodynamically, each belongs to a different aspect of nature. Stem and branches are extensions of the soil, while leaves

and blossoms are considered as belonging to the plant kingdom. The identification of tree and soil can be seen most clearly in winter when both are in a state of barren rest accepting the cosmic forces of frost. Consequently, stem and branches are treated like a soil, a medium for the leaves and blossoms to grow on. By spraying stem and branches with a mixture of clay and sand, the biodynamic gardener attempts to make the tree a more integral part of the soil. As every soil needs fertilization, cow-manure is included in the tree-paste for the purpose of furnishing all the vital plant nutrients in a blended and balanced state. This is an old practice, understood and performed long prior to the discovery by conservative science that trees assimilate nutrients through the bark and even via the leaves.

Any additive to the tree paste is beneficial that can fertilize the tree or has the property of influencing the growth and health of the leaves and blossoms. Mustard flour ideally satisfies both conditions. This highly organic substance is valuable because of its high nitrogen content, high concentration of the odorous and volatile mustard oil, and the comparatively large amount of sulfur released in its breakdown.

THE MARKETING OF GOLDEN ACRES FARM BIO-DYNAMIC PRODUCE

WALTER STUBER & C. R. KEEP, JR.

In 1924 Dr. Pfeiffer asked Rudolf Steiner:

".....'How can it happen that the spiritual impulse, and especially the inner schooling, for which you are constantly providing stimulus and guidance bear so little fruit? Why do the people concerned give so little evidence of spiritual experience, in spite of all their efforts? Why, worst of all, is the will for action, for the carrying out of these spiritual impulses, so weak?' ..... Then came the thought-provoking and surprising answer: 'This is a problem of nutrition. Nutrition as it is today does not supply the strength necessary for manifesting the spirit in physical life. A bridge can no longer be built from thinking to will and action. Food plants no longer contain the forces people need for this.'" (From "New Directions in Agriculture," an article by Ehrenfried E. Pfeiffer which appeared in a volume entitled *Rudolf Steiner, Recollections by Some of his Pupils.* Published 1958 by *The Golden Blade,* London, England.)

* * *

This gap between will and action is also one of the main problems in the marketing of Bio-Dynamic and organic produce. In no other area so much as in food is the essential quality of the product overlooked or ignored. There is a tremendous desire among all shoppers to believe that all food is good. There are at the moment only two distinctions in the general mind, good food and fancy food (the expensive variety of good food). No distinction whatsoever is made on the basis of nutritional quality.

The producer of organic food is therefore faced with a small market dispersed over a wide area. This market consists primarily of people to whom organic food is a *concept* which they, themselves, are not anxious to realize when they know that it takes extra time and money. They know that the food is pound for pound or dollar for dollar superior to the ordinary food in commercial outlets. If the organic producer could distribute his food through the local chain stores at the same price as any other food, then these people would take the trouble to buy it. Of course, no stores, save a very few health stores in metropolitan areas, can handle organic food. The reason is that neither the supply nor the demand is great enough for the volume which food stores must have to make a profit. Some health stores handle a limited variety of organic food, but the customer must pay for the low volume and small turnover.

The problem is not primarily to educate people but to bridge the gap in consumer minds between talking organic food and eating it as if it were the most natural thing in the world. At the same time, of course, to bridge the gap for producers between occasional farm or mail order sales and regular shipments to normal commercial outlets carrying a full range of organic products.

To achieve this, some type of marketing organization must be created which will reach people regularly with a wide variety of organic produce. This should be a flexible organization that can search out the market in its dispersity and finding it can then deliver a meaningful amount of organic food in terms of the consumers' total diet. And do all this economically. Only after such an organization is created can the real work of education be carried forward successfully.

At this moment the only marketing organization which could meet these demands is a co-operative, a joint producer-consumer co-operative. Historically, co-operatives have not been necessary in America since commercial enterprise has been

generally responsive to the needs of consumers and producers alike. Today, the indifference of commercial and government interests to farmers who want to raise nutritionally superior food and to consumers who would like to be protected from the effects of a chemicalized food industry and agriculture creates the exception. An organic co-operative responsive to the economic needs of the farmers and the consumers desire for superior food can flourish and could be the logical source from which an educational campaign could rise.

Golden Acres, therefore, is attempting to develop a co-operative plan to bring farmers and consumers together so that economics in production and distribution can be realized. To do this, groups of consumers are joining together to receive weekly shipments of meat, vegetables, fruits, eggs, poultry, bread, flour, cereal, honey, dairy products, etc. The members of a group make out their orders which are transmitted in sum to the farm several days in advance of the delivery date. The farm groups each day's shipments advantageously to cut down on the unnecessary duplication of delivery miles. The food (carefully packaged to protect it from cold, heat, or crushing, depending on the item) is dropped off at each co-operative on the route. When the food is received (usually at the home of one of the members) it is parcelled out according to the orders. The women pick it up the same day. It is literally as simple as that. Such a procedure is not as hectic as Friday night at the A & P or Saturday morning downtown. The major difficulty is that it is not the routine. It is an act of will to make the unusual the routine; this is the bridge between thought and reality.

In this manner the farms are able to group their shipments as well as plan their production. This latter point is very important if a good supply of many different products is always to be available. This can only be achieved by a co-operative. Consumers, on the other hand, are able to obtain the large majority of their foodstuffs organically at bulk shipment prices and from one source — no more writing to this farm, driving to that one, shopping at various stores.

In short, wherever eight or ten women are interested in weekly deliveries of organic food to meet their weekly needs, a farm belonging to this co-operative will deliver to them the produce of the various members. The co-operative will also deliver produce from approved sources in other parts of the country or the world. Making wholesale purchases for redistribution through the consumer co-operatives of items either

not in season or not grown in a particular area will be one of the important functions the co-operating farms will fulfill.

To meet the demands of the small but growing interest in organic food, farmers must be ready to join together so that they can through their combined capabilities anticipate and direct the growth of the organic market, not merely, as now, follow its peculiar and unbusinesslike vagaries.

To meet the demands of organic farms for a steady and dependable market for all their produce, and to insure that the organic produce they receive is of quality, consumers must join together so that through the importance of their combined orders their wishes and beliefs can be transmitted directly to the farms producing the food. Quite a different picture from the helpless housewife complaining to the chain store that her food must be of high nutritional quality, free from pesticides and hormones. In such a co-operative her connection with the source of supply would be direct and immediate.

One final consideration is of importance. An impartial board of experts must be created to guarantee the food quality, farm practices, and marketing processes. This board for the consumers protection would have the authority to determine the conditions under which farms and products could be included in such a co-operative. This group would establish the much-needed labeling program for organic merchandise, determining what each farmer or producer may say about his products. This group would not operate in contradiction to the NFA, but, on a local level would complement intensively what that group is trying to do extensively on a national basis.

Such a co-operative movement needs the good will and active support of all interested parties — farmers, consumers, and experts. It is worth the effort.

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The Marketing of Golden Acres Farm Bio-Dynamic Produce 48

WINTER, ERNST FLORIAN
The Greenhouse on the B.D. Homestead 48

B.D. WHEAT & RYE FOR SPROUTING

Our Other Products Include

B. D. Rye Flour, Rye Cereal and Cornmeal

Organic Oatmeal, Cheddar Cheese

Made from Unpasteurized Milk

Send a Postal Card for Complete List, and Prices, to

WALTER BUSCHMAN

SUGAR LOAF ORANGE COUNTY, N. Y.

B.D. TREE PASTE

NOW READY FOR DELIVERY

FOR THE SPRAYING OF
FRUIT TREES, SHRUBS, BERRIES,
FOR PRE-EMERGENCE AND FOLIAGE SPRAY
AND FOR FALL PROTECTION.

CAN ALSO BE USED AS MULCH-SPRAY
BETWEEN ROWS IN THE VEGETABLE GARDEN.

For trees, figure about 1 lb. per average medium sized tree for each application.

The tree paste is delivered dry. You need only to stir it in water. Organic insecticides can be added at your convenience.

Prices: 10 lbs., $ 9.50 — 25 lbs., $16. (postpaid)
50 lbs., $22.50 — 80 lbs., $32.00 (f.o.b. Spring Valley, N. Y.)

Orders and further information:

PETER A. ESCHER
THREEFOLD FARM
SPRING VALLEY, N. Y.